

Claims:

1. A method to achieve direct adhesion between an adhesive activated textile reinforcing material and an activated rubber comprising the steps of
 - (A) applying an topcoat composition to the activated textile reinforcing material;
 - (B) fixing the topcoat composition to the material obtained from step (A);
 - (C) embedding the material from step (B) in the activated rubber; and
 - (D) curing the rubber containing the textile reinforcing material obtained from step (C) at a temperature and for a time sufficient to cure said rubber.
2. The method of claim 1 wherein the textile reinforcing material is selected from the group consisting of polyester, rayon, polyamide and aramid.
3. The method of claim 1 wherein the textile reinforcing material is polyester.
4. The method of claim 1 wherein the topcoat composition comprises
 - (i) at least one hydroxyl aromatic compound having at least two hydroxyl groups,
or
a phenolic resin compound obtainable from a hydroxyl aromatic compound having at least one hydroxyl group; and
 - (ii) at least one diene polymer.
5. The method according to claim 1, wherein the topcoat composition is dissolved in a suitable solvent and applied to the textile reinforcing material.
6. The method of claim 5, wherein the suitable solvent comprises water.

7. The method of claim 4, wherein the phenolic resin compound is chosen from the group comprising condensation products of the hydroxyl aromatic compounds condensed with an aldehyde or a ketone with an aldehyde/ketone to hydroxyl aromatic compound molar ratio of less than 1.0.
8. The method of claim 4, wherein the diene polymer is present in the topcoat composition in the form of a latex.
9. The method of claim 1, wherein the topcoat composition is fixed to said textile reinforcing material by exposure to a temperature in the range of from about 20°C to about 250°C, preferably from about 110°C to 240°C, most preferably from about 215°C to 235°C.
10. The method of claim 1, wherein the rubber is selected from the group consisting of diene rubbers, diene/alpha-olefin rubbers, ethylene/propylene rubbers and ethylene/alpha-olefin/diene rubbers.
11. The method of claim 1, wherein the rubber is cured at a temperature of from about 140°C to 220°C, preferably from about 160°C to 200°C, most preferably from about 170°C to 180°C.
12. The method of claim 1, wherein the topcoat composition as applied comprises
- (i) a phenolic resin compound obtainable by the reaction of a hydroxyl aromatic compound (R) with 2 or more aromatic hydroxyl groups containing between about 5, preferably 6 and 14, preferably 10 carbon atoms with an aldehyde containing between about 1 and about 12 carbon atoms, preferably between about 1 and about 7 carbon atoms or a ketone containing between about 3 and about 8 or about 13 carbon atoms, preferably between about 3 and about 6 carbon atoms (F) at a F/R molar ratio of less than 1.0; and
 - (ii) a diene latex having a solids content from about 30 to about 50 %, preferably about 35 to 45 %, most preferably about 40 %,

wherein the dry weight-ratio of resin (i) to latex (ii) is from about 50/50 to about 80/20, based on the total dry weight of (i) and (ii).

13. The method of claim 1, wherein the topcoat composition as applied comprises

(i) a phenolic resin compound having a solids content from about 10 to about 100 %, preferably from about 15 to about 80 %, most preferably from about 20 % obtainable by the reaction of resorcinol (R) with formaldehyde (F) at a F/R molar ratio of less than 1.0; and

(ii) a latex having a solids content from about 30 to about 50 %, preferably about 35 to 45 %, most preferably about 40 %,

wherein the dry weight-ratio of resin (i) to latex (ii) is from about 50/50 to about 80/20, based on the total dry weight of (i) and (ii).

14. The method of claim 12 or 13, wherein the F/R molar ratio is in the range of about 0.2 to about 0.9, preferably from about 0.3 to 0.6, and most preferably about 0.4.

15. The method of claim 1, wherein the topcoat composition as applied comprises

(i) a phenolic resin compound obtainable by the reaction of triallyl cyanurate and/or triallyl isocyanurate with a hydroxyl aromatic compound with 2 or more aromatic hydroxyl groups containing between about 5, preferably 6 and 14, preferably 10 carbon atoms and then reacting the resulting product (R) with an aldehyde containing between about 1 and about 12 carbon atoms, preferably between about 1 and about 7 carbon atoms or a ketone containing between about 3 and about 8 or about 13 carbon atoms, preferably between about 3 and about 6 carbon atoms (F) and solubilizing the resulting product in an aqueous basic solution at a F/R molar ratio of less than 1.0; and

(ii) a diene latex having a solids content from about 30 to about 50 %, preferably about 35 to 45 %, most preferably about 40 %,

wherein the dry weight-ratio of resin (i) to latex (ii) is from about 50/50 to about 80/20, based on the total dry weight of (i) and (ii).

16. The method of claim 1, wherein the topcoat composition as applied comprises

(i) a phenolic resin compound having a solids content from about 10 to about 100 %, preferably from about 15 to about 80 %, most preferably from about 20 %

obtainable by the reaction of triallyl cyanurate and/or triallyl isocyanurate and resorcinol (R), then reacting the resulting product with formaldehyde (F) and solubilizing it in an aqueous basic solution with a F/R molar ratio of less than 1; and

(ii) a latex having a solids content from about 30 to about 50 %, preferably about 35 to 45 %, most preferably about 40 %,

wherein the dry weight-ratio of resin (i) to latex (ii) is from about 50/50 to about 80/20, based on the total dry weight of (i) and (ii).

17. The method of claim 15 or 16, wherein the F/R molar ratio is in the range of about 0.2 to about 0.7, preferably from about 0.3 to 0.6, and most preferably about 0.4.

18. The method of claim 1, wherein the topcoat is present in an amount of from about 0.1 to about 3 % by weight, preferably from about 0.2 to about 2 % by weight, and most preferably from about 0.4 to about 1.5 % by weight, based on the weight of the dry coated textile reinforcing material.

19. The method of claim 1, wherein the textile reinforcing material is selected from the group consisting of filaments, yarns, cords, fabrics, films, tapes and any combination thereof.

20. The method of claim 1, wherein the topcoat composition is applied to the textile reinforcing material during the process of making the textile reinforcing material.

21. The method of claim 1, wherein the rubber contains an RF-adhesion system of resorcinol and resorcinol-formaldehyde precondensate, a methylene donor and active silica.

22. An topcoat composition for imparting adhesion to textile reinforcing materials said composition having no aldehyde and comprising:
- (i) at least one hydroxyl aromatic compound having at least two hydroxyl groups,
or
a phenolic resin compound obtainable from a hydroxyl aromatic compound having at least one hydroxyl group; and
 - (ii) at least one diene polymer.
23. The topcoat composition of claim 22 being aqueous.

~~24. (Canceled) The topcoat composition of claim 22 wherein the phenolic resin compound is chosen from the group comprising condensation products of the hydroxyl aromatic compounds condensed with an aldehyde or a ketone with an aldehyde/ketone to hydroxyl aromatic compound molar ratio of less than about 1:0~~

~~25. (Canceled) The topcoat composition of claim 22 wherein the diene polymer is present in the topcoat composition in the form of a latex.~~

~~26. (Canceled) The topcoat composition of claim 22, wherein the topcoat composition comprises~~

- ~~(i) a phenolic resin compound obtainable by the reaction of a hydroxyl aromatic compound (R) with 2 or more aromatic hydroxyl groups containing between about 5, preferably 6 and 14, preferably 10 carbon atoms with an aldehyde containing between about 1 and about 12 carbon atoms, preferably between about 1 and about 7 carbon atoms or a ketone containing between about 3 and about 8 or about 13 carbon atoms, preferably between about 3 and about 6 carbon atoms (F) at a F/R molar ratio of less than 1.0; and~~
- ~~(ii) a latex having a solids content from about 30 to about 50 %, preferably about 35 to 45 %, most preferably about 40 %, wherein the dry weight-ratio of resin (i) to latex (ii) is from about 50/50 to about 80/20, based on the total dry weight of (i) and (ii)~~

~~27 (Canceled) The topcoat composition of claim 22, wherein the topcoat composition comprises~~

~~(i) a phenolic resin compound having a solids content from about 10 to about 100 %, preferably from about 15 to about 80 %, most preferably from about 20 % obtainable by the reaction of resorcinol (R) with formaldehyde (F) at a F/R molar ratio of less than about 1.0; and~~

~~(ii) a latex having a solids content from about 30 to about 50 %, preferably about 35 to 45 %, most preferably about 40 %,~~

~~wherein the dry weight-ratio of resin (i) to latex (ii) is from about 50/50 to about~~

~~60/20, based on the total dry weight of (i) and (ii)~~

~~28. (Canceled) The topcoat composition of claim 26 or 27, wherein the F/R molar ratio is in the range of about 0.2 to about 0.9, preferably from about 0.3 to 0.6, and most preferably about 0.4.~~

~~29 (Canceled) The topcoat composition of claim 22, wherein the adhesive topcoat composition comprises~~

~~(i) a phenolic resin compound obtainable by the reaction of triallyl cyanurate and/or triallyl isocyanurate with a hydroxyl aromatic compound with 2 or more aromatic hydroxyl groups containing between about 5, preferably 6 and 14, preferably 10 carbon atoms and then reacting the resulting product (R) with an aldehyde containing between about 1 and about 12 carbon atoms, preferably between about 1 and about 7 carbon atoms or a ketone containing between about 3 and about 8 or about 13 carbon atoms, preferably between about 3 and about 6 carbon atoms (F) and solubilizing the resulting product in an aqueous basic solution at a F/R molar ratio of less than 1.0; and~~

~~(ii) a latex having a solids content from about 30 to about 50 %, preferably about 35 to 45 %, most preferably about 40 %,~~

~~wherein the dry weight-ratio of resin (i) to latex (ii) is from about 50/50 to about~~

~~60/20, based on the total dry weight of (i) and (ii)~~

~~30 (Canceled) The topcoat composition of claim 22, wherein the adhesive topcoat composition comprises~~

~~(i) a phenolic resin compound having a solids content from about 10 to about 100 % , preferably from about 15 to about 80 % , most preferably from about 20 % obtainable by the reaction of triallyl cyanurate and/or triallyl isocyanurate and resorcinol, then reacting the resulting product with formaldehyde and solubilizing it in an aqueous basic solution with a F/R molar ratio of less than about 1; and~~

~~(ii) a latex having a solids content from about 30 to about 50 % , preferably about 35 to 45 % , most preferably about 40 % , wherein the dry weight-ratio of resin (i) to latex (ii) is from about 50/50 to about 80/20, based on the total dry weight of (i) and (ii).~~

~~34. (Canceled) The topcoat composition of claim 29 or 30, wherein the F/R molar ratio is in the range of about 0.2 to about 0.7, preferably from about 0.3 to 0.6, and most preferably about 0.4.~~

24. ~~32.~~ An activated textile reinforcing material obtainable by a method comprising the steps of
(A) applying a topcoat composition to a an activated textile reinforcing material;
and
(B) fixing the topcoat composition to the material obtained from step (A).

25. ~~33.~~ The material of claim 32 wherein the textile reinforcing material is selected from the group of polyester, rayon, polyamide and aramid.

26. ~~34.~~ The material of claim 32 wherein the textile reinforcing material is polyester.

27. ~~35.~~ The material of claim 32, wherein the topcoat composition is dissolved in a suitable solvent and applied to the textile reinforcing material.

28. ~~36.~~ The material of claim 35, wherein the suitable solvent comprises water.

29. 37. The material of claim 32, wherein the textile reinforcing material is selected from the group consisting of filaments, yarns, cords, fabrics, films, tapes, and any combination thereof.

30. 38. The material of claim 32, wherein the topcoat composition is applied to the textile reinforcing material during the process of making the textile reinforcing material.

31. 39. The material of claim 32 wherein the topcoat composition comprises

- (i) at least one hydroxyl aromatic compound having at least two hydroxyl groups, or
a phenolic resin compound obtainable from a hydroxyl aromatic compound having at least one hydroxyl group; and
- (ii) at least one diene polymer.

32. 40. The material of claim 32 wherein the topcoat composition is an aqueous composition.

33. 41. The material of claim 32 wherein, after having applied the topcoat to the textile reinforcing material, the topcoated textile reinforcing material is exposed to a temperature in the range of from about 20°C to about 250°C, preferably from about 110°C to 240°C, most preferably from about 215°C to 235°C.

34. 42. The material of claim 32 wherein the topcoat composition comprises

- (i) a phenolic resin compound obtainable by the reaction of a hydroxyl aromatic compound (R) with 2 or more aromatic hydroxyl groups containing between about 5, preferably 6 and 14, preferably 10 carbon atoms with an aldehyde containing between about 1 and about 12 carbon atoms, preferably between about 1 and about 7 carbon atoms or a ketone containing between about 3 and about 8 or about 13 carbon atoms, preferably between about 3 and about 6 carbon atoms (F) at a F/R molar ratio of less than 1.0; and

(ii) a latex having a solids content from about 30 to about 50 %, preferably about 35 to 45 %, most preferably about 40 %, wherein the dry weight-ratio of resin (i) to latex (ii) is from about 50/50 to about 80/20, based on the total dry weight of (i) and (ii).

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The material of claim 32 wherein the topcoat composition comprises

- (i) a phenolic resin compound having a solids content from about 10 to about 100 %, preferably from about 15 to about 80 %, most preferably from about 20 % obtainable by the reaction resorcinol (R) with formaldehyde (F) at a F/R molar ratio of less than about 1.0; and
- (ii) a latex having a solids content from about 30 to about 50 %, preferably about 35 to 45 %, most preferably about 40 %, wherein the dry weight-ratio of resin (i) to latex (ii) is from about 50/50 to about 80/20, based on the total dry weight of (i) and (ii).

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The material of claim ~~42~~ or ~~43~~, wherein the F/R molar ratio of the resin is in the range of about 0.2 to about 0.9, preferably from about 0.3 to 0.6, and most preferably about 0.4.

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The material of claim 32 wherein the topcoat composition comprises

- (i) a phenolic resin compound obtainable by the reaction of triallyl cyanurate and/or triallyl isocyanurate with a hydroxyl aromatic compound with 2 or more aromatic hydroxyl groups containing between about 5, preferably 6 and 14, preferably 10 carbon atoms and then reacting the resulting product (R) with an aldehyde containing between about 1 and about 12 carbon atoms, preferably between about 1 and about 7 carbon atoms or a ketone containing between about 3 and about 8 or about 13 carbon atoms, preferably between about 3 and about 6 carbon atoms (F) and solubilizing the resulting product in an aqueous basic solution at a F/R molar ratio of less than 1.0; and
- (ii) a latex having a solids content from about 30 to about 50 %, preferably about 35 to 45 %, most preferably about 40 %,

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AMENDED SHEET

wherein the dry weight-ratio of resin (i) to latex (ii) is from about 50/50 to about 80/20, based on the total dry weight of (i) and (ii).

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The material of claim 32 wherein the topcoat composition comprises

(i) a phenolic resin compound having a solids content from about 10 to about 100 %, preferably from about 15 to about 80 %, most preferably from about 20 % obtainable by the reaction of triallyl cyanurate and/or triallyl isocyanurate and resorcinol (R), then reacting the resulting product with formaldehyde (F) and solubilizing it in an aqueous basic solution with a F/R molar ratio of less than about 1; and

(ii) a latex having a solids content from about 30 to about 50 %, preferably about 35 to 45 %, most preferably about 40 %, wherein the dry weight-ratio of resin (i) to latex (ii) is from about 50/50 to about 80/20, based on the total dry weight of (i) and (ii).

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The material of claim 37 or 38, wherein the F/R molar ratio of the resin is in the range of about 0.2 to about 0.7, preferably from about 0.3 to 0.6, and most preferably about 0.4.

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The material of claim 32 wherein the topcoat composition is present in an amount of from about 0.1 to about 3 % by weight, preferably from about 0.2 to about 2 % by weight, and most preferably from about 0.4 to about 1.5 % by weight, based on the weight of the dry coated adhesive activated textile reinforcing material.

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A reinforced rubber article obtainable by a method comprising the steps of

- (A) applying an topcoat composition to a an activated textile reinforcing material;
- (B) fixing an topcoat composition to the material obtained from step (A);
- (C) embedding the material from step (B) in an activated rubber; and
- (D) curing the rubber containing the reinforcing material obtained from step (C) at a temperature and for a time sufficient to cure said rubber.

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The article of claim 49 wherein the textile reinforcing material is selected from the group consisting of polyester, rayon, polyamide and aramid.

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The article of claim 49 wherein the textile reinforcing material is polyester.

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The article of claim 49 wherein the topcoat composition comprises

- (i) at least one hydroxyl aromatic compound having at least two hydroxyl groups, or
- a phenolic resin compound obtainable from a hydroxyl aromatic compound having at least one hydroxyl group; and
- (ii) at least one diene polymer.

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The article according to claim 49, wherein the topcoat composition is dissolved in a suitable solvent and applied to the textile reinforcing material.

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The article of claim 53, wherein the suitable solvent comprises water.

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The article of claim 52, wherein the phenolic resin compound is chosen from the group comprising condensation products of the hydroxyl aromatic compounds condensed with an aldehyde or a ketone with an aldehyde/ketone to hydroxyl aromatic compound molar ratio of less than about 1.0.

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The article of claim 42, wherein the diene polymer is present in the topcoat in the form of a latex.

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The article of claim 49, wherein the topcoat composition is fixed to said textile reinforcing material by exposure to a temperature in the range of from about 20°C to about 250°C, preferably from about 110°C to 240°C, most preferably from about 215°C to 235°C.

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The article of claim 49, wherein the rubber is selected from the group consisting of diene rubbers, diene/alpha-olefin rubbers, ethylene/propylene rubbers and ethylene/alpha-olefin/diene rubbers.

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The article of claim 49, wherein the rubber is cured at a temperature of from about 140°C to 220°C, preferably from about 160°C to 200°C, most preferably from about 170°C to 180°C.

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The article of claim 49, wherein the topcoat composition applied comprises

(i) a phenolic resin compound obtainable by the reaction of a hydroxyl aromatic compound (R) with 2 or more aromatic hydroxyl groups containing between about 5, preferably 6 and 14, preferably 10 carbon atoms with an aldehyde containing between about 1 and about 12 carbon atoms, preferably between about 1 and about 7 carbon atoms or a ketone containing between about 3 and about 8 or about 13 carbon atoms, preferably between about 3 and about 6 carbon atoms (F) at a F/R molar ratio of less than 1.0; and

(ii) a latex having a solids content from about 30 to about 50 %, preferably about 35 to 45 %, most preferably about 40 %, wherein the dry weight-ratio of resin (i) to latex (ii) is from about 50/50 to about 80/20, based on the total dry weight of (i) and (ii).

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The article of claim 49, wherein the topcoat composition applied comprises

(i) a phenolic resin compound having a solids content from about 10 to about 100 %, preferably from about 15 to about 80 %, most preferably from about 20 % obtainable by the reaction of resorcinol (R) with formaldehyde (F) at a F/R molar ratio of less than about 1.0; and

(ii) a latex having a solids content from about 30 to about 50 %, preferably about 35 to 45 %, most preferably about 40 %, wherein the dry weight-ratio of resin (i) to latex (ii) is from about 50/50 to about 80/20, based on the total dry weight of (i) and (ii).

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~~52~~ (Original) The article of claim ~~60~~ or ~~61~~, wherein the F/R molar ratio is in the range of about 0.2 to about 0.9, preferably from about 0.3 to 0.6, and most preferably about 0.4.

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~~54~~ (Original) The article of claim 49, wherein the topcoat composition applied comprises

(i) a phenolic resin compound obtainable by the reaction of triallyl cyanurate and/or triallyl isocyanurate with a hydroxyl aromatic compound with 2 or more aromatic hydroxyl groups containing between about 5, preferably 6 and 14, preferably 10 carbon atoms and then reacting the resulting product (R) with an aldehyde containing between about 1 and about 12 carbon atoms, preferably between about 1 and about 7 carbon atoms or a ketone containing between about 3 and about 8 or about 13 carbon atoms, preferably between about 3 and about 6 carbon atoms (F) and solubilizing the resulting product in an aqueous basic solution at a F/R molar ratio of less than 1.0; and

(ii) a latex having a solids content from about 30 to about 50 %, preferably about 35 to 45 %, most preferably about 40 %, wherein the dry weight-ratio of resin (i) to latex (ii) is from about 50/50 to about 80/20, based on the total dry weight of (i) and (ii).

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~~54~~ (Original) The article of claim 49, wherein the topcoat composition applied comprises

(i) a phenolic resin compound having a solids content from about 10 to about 100 %, preferably from about 15 to about 80 %, most preferably from about 20 % obtainable by the reaction of triallyl cyanurate and/or triallyl cyanurate and resorcinol (R), then reacting the resulting product with formaldehyde (F) and solubilizing it in an aqueous basic solution with a F/R molar ratio of less than about 1; and

(ii) a latex having a solids content from about 30 to about 50 %, preferably about 35 to 45 %, most preferably about 40 %, wherein the dry weight-ratio of resin (i) to latex (ii) is from about 50/50 to about 80/20, based on the total dry weight of (i) and (ii).

59
AMENDED SHEET

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~~56~~ (Original) The article of claim ⁵⁵~~53~~ or ⁵⁶~~54~~, wherein the F/R molar ratio is in the range of about 0.2 to about 0.7, preferably from about 0.3 to 0.6, and most preferably about 0.4.

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~~57~~ (Original) The article of claim 49, wherein the topcoat is present in an amount of from about 0.1 to about 3 % by weight, preferably from about 0.2 to about 2 % by weight, and most preferably from about 0.4 to about 1.5 % by weight, based on the weight of the dry coated textile reinforcing material.

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~~58~~ (Original) The article of claim 49, wherein the textile reinforcing material is selected from the group consisting of filaments, yarns, cords, fabrics, films, tapes, and any combination thereof.

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~~59~~ (Original) The article of claim 49, wherein the topcoat composition is applied to the textile reinforcing material during the process of making the textile reinforcing material.

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~~60~~ (Original) The article of claim 49, having improved dynamic fatigue properties.

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~~61~~ (Original) A tire, hose, V-belt or conveyor belt obtainable from the article of anyone of claims ⁴¹~~49~~ to ⁶¹~~69~~.

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